

Preanalytical venous blood sampling practices demand improvement — A survey of test-request management, test-tube labelling and information search procedures [☆]

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Received 6 February 2008; accepted 18 February 2008

Available online 21 February 2008

Abstract

Background: Most errors in laboratory medicine are preanalytical in nature. In the present study, we aimed to survey preanalytical steps in venous blood sampling, prior to actual sample collection. These steps included test-request management and test-tube labelling, as well as information search procedures.

Methods: Venous blood sampling staff ($n=314$, response rate 94%) in hospital wards and laboratories completed a questionnaire related to clinical chemistry testing.

Results: Instructions for test-request management and test-tube labelling were not always followed. For example, only 66% of the ward staff reported always checking the test-request if someone else completed it, compared to 90% of the laboratory staff ($p=0.003$). As few as 16% of the ward staff reported desirable practices regarding test-tube labelling, compared to 100% of the laboratory staff ($p<0.001$). Furthermore, 18% of the ward staff reported always using online manuals (the only source of updated information), compared to 63% of the laboratory staff ($p<0.001$).

Conclusions: Our results indicate a substantial risk of preanalytical error in test-request management, test-tube labelling, and information search practices, particularly in the wards. Our findings thus underscore the importance of quality control in venous blood sampling, in order to increase patient safety in modern health care.

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Keywords: Blood specimen collection; Guideline adherence; Medical errors; Phlebotomy; Questionnaires; Safety management

1. Introduction

Medical errors cause a large number of deaths annually and lead to excess economic burden [1,2]. Laboratory tests can have

a major impact on medical decisions [3], and a large number of analyses are conducted each year. However, up to 0.5% of all laboratory test-results have estimated to be erroneous [4,5]. Of these, the majority are of preanalytical origin, occurring before the laboratory analysis [4–9]. Thus, in order to improve patient safety, reduction of the frequency of preanalytical errors should be an important issue for all health care providers.

The majority of preanalytical errors can be related to incorrect information on the test-request or test-tube label [10,11]. Despite the apparent importance of these sources of error, relatively little is known about how they occur, and thus what could be done to prevent them.

Abbreviations: VBS, venous blood sampling; COES, computerised order entry system; DP, desirable practice.

[☆] **Research funding:** This study was funded by the Faculty of Medicine, Umeå University, Umeå, Sweden and the National Board of Health and Welfare in Sweden.

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Table 1
Details of the staff performing venous blood sampling in two district hospitals (all wards) and two clinical chemistry laboratories

	Wards		Laboratories		<i>p</i> value
	<i>n</i>	%	<i>n</i>	%	
Response rate	274	93	40	100	–
Women	264	96	39	98	1.0 ^a
Working full time	140	51	34	85	<0.001 ^b
Performing venous blood sampling at least weekly	229	84	15	39	<0.001 ^b
Enrolled nurses ^d	250	91	2	5.0	<0.001 ^a
Psychiatric orderlies	24	8.8	0	0	<0.001 ^a
Biomedical technicians	0	0	38	95	<0.001 ^a
Documented routines for venous blood sampling	17	6.2	40	100	<0.001 ^b
Formal education in venous blood sampling	250	91	38	95	0.552 ^a
Further education in venous blood sampling	16	6.2	11	30	<0.001 ^a
Accreditation in venous blood sampling	0	0	40	100	<0.001 ^b
Certification in venous blood sampling	0	0	40	100	<0.001 ^b
	<i>n</i>	Mean (SD)	<i>n</i>	Mean (SD)	<i>p</i> value
Age (years)	272	50 (9.2)	40	45 (12)	0.005 ^c
Duration of employment (years)	269	12 (9.6)	40	18 (14)	0.001 ^c

SD, standard deviation. *p* values measured with ^aFischer's exact test, ^bChi-2 test, or ^c χ -test. ^dAlso called assistant nurses or licensed-to-practice nurses.

In modern laboratories, information about venous blood sampling (VBS) is generally provided to VBS staff through online manuals, which are much easier to update than paper-based manuals. Indeed, incomplete and/or infrequent revision of paper-based laboratory manuals has been reported [12,13]. However, data concerning whether such on-line manuals are the primary means by which staff obtain VBS information, and if VBS is performed according to such instructions, are limited.

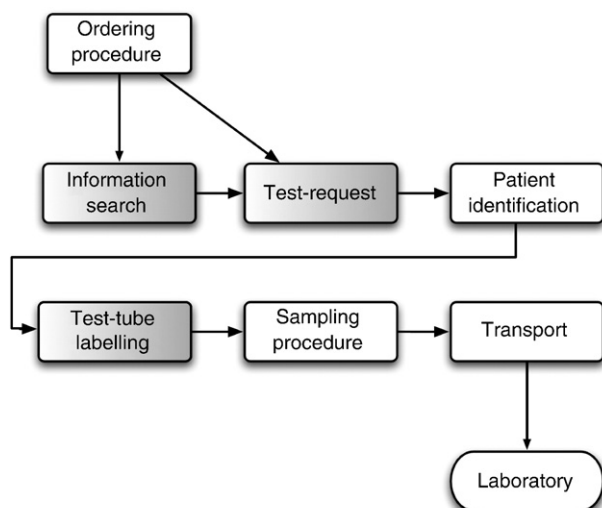


Fig. 1. A summary of the preanalytical steps in venous blood sampling in the units surveyed. The shaded boxes represent aspects addressed in this study.

Clinical laboratories are often accredited [14], meaning that daily work is documented and performed according to strict routines, aimed at reducing errors. In contrast, such quality control measures are still uncommon in hospital wards. Not surprisingly, VBS performed by laboratory staff is therefore associated with fewer errors, compared to VBS performed by other personnel categories [8,15–20].

Research addressing the preanalytical phase of VBS has predominantly focused on quantifying the actual error rates, rather than investigating the practices potentially leading to errors. The aim of the present study was thus to investigate practical test-request management, test-tube labelling, and information search procedures with respect to VBS across all wards in two hospitals, and to compare the results with those for the VBS staff in two hospital laboratories.

2. Materials and methods

2.1. Subjects and setting

Internationally, the staff performing VBS are varied, and can include physicians, registered nurses, enrolled nurses (also called assistant nurses, the approximate equivalent of licensed-to-practice nurses, LPNs, in North America), specific VBS staff employed by the laboratory, or other staff categories. In hospital wards in Sweden, enrolled nurses or psychiatric orderlies most often perform VBS. These staff categories also perform basic patient care, as well as other tasks such as blood pressure checks, urinary catheterization, wound care, and echocardiography. Their education generally includes 3 years of upper secondary school in a vocational or technical program. Clinical chemistry laboratories in Sweden are mainly staffed by biomedical technicians, who have a three-year university education. They conduct biochemical analyses and perform VBS at the laboratory. A small number of enrolled nurses also work specifically with VBS in the laboratories.

This study had a cross-sectional design and included all staff on duty and responsible for the majority of VBS in two district hospitals (230 beds and 152

Table 2

Instructions for test-request management, test-tube labelling, and information search procedures in two district hospitals (all wards) and two clinical chemistry laboratories

Preanalytical step	Instruction from the laboratory
Information search	Information regarding the handling and collection of venous blood samples is obtained from on-line manuals issued by the local laboratory.
Test-request management	The information on the paper-based test-request is compared with the ordering information. The patient's name and Swedish identification number are written by hand or stamped on the request. During patient identification, the patient's name and Swedish identification number are compared with the corresponding information on the test-request. Priority (acute or normal) is noted on the request. A check is made that the orderer of the test is marked via barcode or otherwise written by hand on the request.
Time of sampling	The time of sampling is noted on the test-request during the sampling procedure. If the sampling time is incorrect, it is adjusted.
Test-tube labelling	If analysis-specific labels do not exist, then the requested analysis is written by hand on the correct label on the back of the test-request. The label is transferred to the test-tube before sampling.
Bar-code numbers	The barcode number on the test-request and test-tube are compared to ensure that they match.

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